



ISSD

NEWSLETTER

Volume II Number 1

January 1989

Note From the Editor:



Without the limitations imposed by the "featured frog format" we were able to put together a newsletter with a much greater variety of material for this first edition of Volume II.

This is not without its downside however. We had been holding some good material in reserve because it did not fit in with past features. This edition exhausts that backlog of material. We hope that some new papers will be forthcoming in the near future. Also, we are hoping that some of you will consider submitting papers that include photos (black and white only at this time please) because we are ready to take the step-up to publication of photos.

In this edition you will find some interesting material. There is a very good article on the raising of wax moth larvae. We are always in need of new ideas on different live food sources. We have an interesting article describing the experiences of one of our Dutch members with the breeding of *Dendrobates pumilio*. In his paper he makes the comment that although some of the details of the day to day events of his breeding efforts have now become common place to him, he never-the-less has made a full record and is submitting it to us. This is very valuable. Often times there are pearls of wisdom hidden in what seems common place to us. When data is submitted to us only in its refined form it may very well be that those pearls are lost. In addition, I am sure that the breeding of *Dendrobates pumilio* is "common place" to very few of our readers. In reading through this log of facts one can feel the frustrations and the eventual sense of triumph. In the same

vein, there is a paper by another of our Dutch friends, Luuc Bauer, giving his observations on the breeding of *Dendrobates leucomelas*. Once again we hear from the venerable Erik Wevers; Is there any frog that this fellow does not have in his collection? He writes of his experiences with *Dendrobates silverstonei*. One might get the impression that if you are not Dutch you cannot write for this newsletter. Not true - all papers are "willkommen". Scott Solar submits an essay encouraging us to give careful attention to details of the natural habitat of our animals when designing captive environments for them; this is good advice.

I have already made my customary plea for more material but I would like to elaborate a little. There are some things that I am particularly interested in seeing in future newsletters. I would like to see some essays or papers of opinion concerning the question of crossbreeding, or hybridization, both inter-species and intra-species. If you have an opinion, submit a paper. Several differing opinions would be interesting. Also, I think we could use a good general paper on the CITES treaty. Perhaps some of our readers would like to know just what these CITES regulations are all about and what their implications are to us now that Dendrobatids are listed on Appendix II of the treaty. There have been many taxonomic changes lately and the classification system is now quite complicated. Would anyone care to update us on these changes? We will be publishing an important paper on taxonomic classification by Helmut Zimmermann as soon as we can get it translated into English. We hope that this will be in time for the next edition (Volume II, number 2).

Dendrobates silverstonei

SOME OBSERVATIONS

by Erik Wevers

Dendrobates silverstonei has been kept in collections in Holland, Germany, and Belgium for several years now. Success with this species has not been very good. It has been possible to sustain specimens alive for long periods of time but few lay eggs and the young frogs that are produced are very difficult to raise.

D. silverstonei is quite a large dendrobatid, averaging 36 to 42.5 mm, with some specimens being even larger. The females usually are 1 to 2 cm larger than the males. The basic colour is red or reddish orange and is quite variable from one specimen to the next. They also have black skin markings with a great deal of individual variability. The skin of the dorsum is distinctly granular, even more so than is the case with *D. granuliferus*. Juvenile animals are black, the red colour becoming increasingly more apparent as the animals mature.

D. silverstonei is found in the Cordillera Azul of Peru, which has an altitude of about 2000 meters. The

frogs are most frequently found at an altitude of from 1300 to 1800 meters in these mountains. The habitat of *D. silverstonei* is rapidly being destroyed, almost no rainforest remains. At these altitudes the temperature ranges from 20° to 28° C during the day and 16° to 20° C at night. Experience in the European collections suggests that the best temperature to keep them at is 25° C during the day and 18° C at night. The native habitat is very very wet and the vegetation is extremely dense. The best terrariums are kept very wet and there should be exceptionally dense plantings as well as stones, large branches for climbing and many hiding places. The terraria should also be quite large, at least 75 x 50 x 70 cm and even larger if possible. These frogs are quite large and are excellent jumpers; the larger the enclosure the better.

In the wild these frogs are quite difficult to catch. They do not exist in dense populations, individuals usually are not found closer than four to eight meters from one another. They are

not arboreal in habit but are excellent jumpers and make their escapes very quickly. They are fond of basking in the sun. They eat a wide range of insects, from tiny drosophila to spiders as large as two centimeters.

D. silverstonei lays large clutches of eggs, as many as thirty to fifty-five per clutch. Eggs are laid in dark wet places. Tadpole care is usually done by the male, however the female may also engage in this activity. The tadpoles are not difficult to raise, they will eat almost anything. Despite this, the breeding of this species is not going very well in Europe at the present time. Perhaps in the future it will improve as we learn more about this species. The call of the male is pleasant to hear. My male has been calling for the past few weeks and I am anxiously awaiting eggs, hoping to find them any day .

It is critical that we become successful with this species because they are threatened by habitat destruction. Also, the political situation in Peru is not very good and it is unlikely that we will be getting many new wild caught frogs, so the few specimens that we have must breed!

Captive Care and Breeding of any Species, with Special Attention Paid to the Family:Dendrobatidae

by : Scott Solar

This article was prompted by a conversation with Gary Chandler, during which he stated that the general opinion of Dendrobatid frog keepers is that there are but a few species that really do well in a captive situation. My aim is to help reverse this situation, not by giving detailed husbandry information, but rather by encouraging the habit of careful attention to natural microhabitat information available for any particular species.

It is widely accepted that the proper condition for the care of Dendrobatids is in a comparatively large glass container (i.e. 20 to 40 gallon aquarium) with many plants and much moisture. The accepted ideal temperature is 84° F in the day and 78° F at night. The variation of the photoperiod seems to be a matter of some controversy. This works remarkably well for a handful of species (*D. auratus*, *D. tinctorius*, *D. leucomelas*), but is met with only limited

success for other species (notably *D. histrionicus*). It is my contention that these conditions have proven to be satisfactory only for those species that originated in a similar wild habitat. How much do you actually know about the climatic and flora variations where the species you intend to keep was captured?

One success story, unfortunately preceded by many years of frustration and the death of many animals, is that of the Jackson's Chameleon (*Chameleo jacksoni*). For fifty years everyone "knew" that they came from Kenya; located right on the equator: tropical, steamy,..., but no one seemed to be able to keep this interesting creature alive for any length of time and breeding it was chancy at best. There was considerable discussion of the large territorial needs of the males. This was correct, but by no means complete. Approximately five years ago Cheryl Dewitt of Del Mar, California learned that these animals in fact were actually found at elevations above 5000 feet and that at that altitude the mean temperature is in the low 50s F. Until then "Kenya" meant HOT and DRY to herptile keepers. Whoever thought of temperature climes on the equator? Cheryl experimented with outdoor

enclosures in her backyard, which is near the Pacific Ocean. There the average temperature fluctuates from 40° F to 85° F; when it gets hotter than that she moves them indoors (C. Dewitt, 1988). Cheryl is now working with her fifth generation of captive bred Jackson's. This success story leads me to believe that the "optimum" conditions we chose for our Dendrobatids is what is behind our failures with some species. One might infer this conclusion logically by considering that microhabitats are filled by individual species rather than the family or genus as a whole.

It has also been shown recently that chameleons require a widely varied diet; a minimum of five species of food are required (Ernie Wagner, personal communication). This may also be true with some of the more sensitive frog species. Not much research has been directed towards determining the nutritional requirements of frogs. Some other possibilities to consider may include the plants in the enclosures. Helmut and Elke Zimmermann, of Stuttgart, West Germany, appear to grow the proper species of Bromeliad in their frog cages (Zimmermann, et al 1986). Personally, based on their enormous successes where others have failed, I intend to copy their cage

conditions as well as I can.

Basically what I am advocating is this, we need to ask ourselves: Where did this animal come from? What are the mean temperatures and temperature variations encountered in the actual habitat of the animal in question? What does it eat? Are there any climatic conditions peculiar to its natural habitat that we can duplicate?

All in all, I hope that we can use this society (ISSD) to collectively solve the mysteries involved with the keeping of these animals. This cannot help but make our colonies better and our critters happier.

References:

Dewitt, Cheryl; *The Vivarium*, vol I, pp 17-20, 1988

Zimmermann, Elke; Breeding Terrarium Animals, 1986 TFH

Announcement:

An F₁ generation American Frog Breeder has been born!

Mitchell Lawrence Bertram

Born to Dale and Gail Bertram on January 20th, 1989.
(Please excuse the literary license here so blatantly abused by the Newsletter editor.)

"HELPFUL HINTS"

The following paper is reprinted from the Wisconsin Herpetological Society Newsletter. A notation in that newsletter reads: "stolen from the Minnesota Herpetological Society Newsletter, May 1988, Volume VIII Number 5." It is being reprinted here because it is such a fine paper. Many thanks to Mr. Plutko!

WAXWORM CULTURE

By: Ernest Plutko

Waxworms can be fairly easily cultured at home in any quantity needed and make an excellent live food for small to medium sized lizards and amphibians. They do not have the chitinous exoskeletons, found on crickets and mealworms, which cause digestive tract impactions in your animals.

Waxworms are the larvae of the greater waxmoth, *Galleria mellonella*, whose approximately sixty day life cycle consists of the egg, eight larva instar, pupa, and adult moth stages. In nature the waxmoth is

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ON DENDROBATES AND CLUTCH SIZE

with observations on display and oviposition in *Dendrobates leucomelas*.

by: Luuc BAUER

Abstract: *Wij denken bij typische Dendrobates aan D. tinctorius, D. leucomelas en verwante soorten. Hierin doen we verslag van het baltsvertoon (trippelvertoon) en het afzetgedrag zoals we dat waarnamen bij D. leucomelas.*

The generic name *Dendrobates* has been used in several ways. The definition by Savage, further defining by Silverstone and the subsequent alterations by Myers cs, if combined with observations on breeding behavior in captivity, present us with the certainty now again of an "unwieldy genus" containing species without a close affinity.

Terrarium observations teach that there is a difference in mating behavior, in clutch size, and in tadpole lifestyles between taxa which some vivarists refer to as "dendrobatid" or "phyllobatid" although such does not represent taxonomic meaning of the word but simply indicates differences seen. Apart from such phenomenon as cannibalistic feeding behavior and tadpole feeding with unfertilized eggs, clutch size in typical "dendrobatid" frogs is quite small; generally less than twelve eggs per clutch. With our pairs of *Dendrobates leucomelas* we found clutch sizes of three to nine eggs, with five, six, or seven seeming to be the norm.

The *Dendrobates/Phyllobates* (??) *pictus* and *trivittatus* groups, judging from captive behavior and body form, represent a different type of relationship than do the *histrionicus* and *tinctorius* species groups. We think of species in these latter groups as true *Dendrobates*.

The genus *Dendrobates* in a strict sense contains small to moderately small frogs (relative to "frogs" in the generic sense but actually fairly large for Dendrobatids) with a striped or spotted pattern of bright coloration on a dark background and with flared toepads which are used in display. The display movements observed include the following: toepads are bent upwards, toes are raised and by a rapid pattering, the feet are advertised. We call this behavior TRIP DISPLAY.

We do hope that our simple, and perhaps not very "scientific" observations will enable other students of these interesting frogs to better interpret the facts; and also to repeat our observations and begin breeding programmes of their own. Centralized data collection for breeding and mating behavior might serve several purposes. In our opinion any remarks from observation of free and natural populations as well as from captive populations could prove to be quite useful. Therefore we present our observations here, and encourage others to do likewise:

Dendrobates leucomelas is a yellow banded black frog. We kept this species together with specimens of *Dendrobates auratus*, *Ololygon rubra*, *Anolis carolinensis* & *A. sabanus* in a container measuring 170 x 115 x 75 cm (length-height-depth). This terrarium representing, if you will, a tropical rainforest in miniature is planted with a diverse vegetation: *Aeschynanthus lobbianus*, *Carex morowii*, *Ceropegia woodii*, *Chamaedora elegans*, *Dracaena deremensis*, *Ficus repens*, *Guzmania berteroniana*, *Gynura aurantiaca*, *Neoregelia carolinae*, *Platyterium bifurcatum*, *Vriesea splendens*, *Vriesea werckleana* and several miniature orchids as well as different species of *Tillandsia* and *Cryptanthus*. The relative humidity averages between 80% and 90%, temperature +/- 26° C.

Observations:

12.00 hours Whistling trill of male

14.00 hours After the approach of a female, the male begins trip displaying, bowing in obeisance and rotating in front of the female.

14.15 hours Turning around her, the male moves away in search of a

favorable site, the female following closely. This search is a time consuming occupation, each bromeliad inspected leaf after leaf. Time and again he touches the female with his head, whistling, trip displaying, and offering obeisance.

17.00 hours At last a leaf located near the center of their enclosure is found to be in order by the male. The female is lured nearer and then pushed into the leaf axil. The male plants himself in front of the female. After some time, trip displaying is again observed but no amplexus occurs.

18.00 hours The male withdraws himself, retiring to the left top corner while the female retains her place.

18.30 hours The female begins turning round and round, her legs stretched wide, and with pattering of the feet produces little shocks, shaking the leaf.

19.30 hours The male returns and sits down at a distance of two leaves from her. She approaches and settles near him. The male immediately inspects leaf after leaf, standing high to do so. The female withdraws into the water of another bromeliad.

19.45 hours Upon seeing the eggs the male closely inspects them, then climbs over the clutch and begins fertilization: standing with the head down, hindlegs stretched high and vent pointing upward, he strains vigorously. He then lowers himself tight onto the eggs and with the hindlegs presses them against his body, turning first on and then above, the clutch.

20.00 hours During this time the female has left her bromeliad bath and retired to the top left corner. The male stays busy for about three quarters of an hour on the clutch.

20.15 hours The male slowly comes forward, another approaching female *D. leucomelas* is knocked from the leaf by a butt of his head. Once again inspecting the clutch, he issues a trilling recital and heads along the same trail as did his mate, retiring to the top left corner.

Total time from the first whistling of the male is eight hours, from the approach of the female is six hours. The period from the onset of whistling to the actual oviposition is seven hours. The age of the parent frogs is approximately two years. Prior to this we had found four clutches but this was the first occasion we had to observe the entire sequence.

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Literature:

Myers, C.W., J.W. Daly & B. Malkin
A Dangerously Toxic New Frog (Phyllobates) used by Ember Indians of Western Colombia, with Discussion of Blowgun Fabrication and Dart Poisoning.
Am. Mus. Nat. Hist, 1978

Savage, J.M., The Dendrobatid Frogs of Central America. Copeia. 1968

Silverstone, Philip A., A Revision of the Poison-Arrow Frogs of the Genus Dendrobates WAGLER. Los Angeles County Museum of Natural History Science Bulletin 21, 1975.

Silverstone, Philip A., A Revision of the Poison-Arrow Frogs of the Genus Phyllobates BIBRON in SAGRA. (Family Dendrobatidae). Los Angeles County Museum of Natural History Science Bulletin 27, 1976.

Classified Ads:

Wanted: Contact with any member keeping and breeding *D. azureus* or *D. tinctorius*. Correspondence to Douglas Sherriff, Reptile Dept. Edinburgh Zoo, Murryfield, Edinburgh, EH12 6JH, Scotland.

Wanted: Female *D. histrionicus* (bullseye pattern); Call Sam at 914- 638-0914-358-1357

a pest living in honey bee colonies, eating the beeswax and bee larvae shed skins.

Waxworms purchased at a bait shop or pet shop have been exposed to an elevated temperature to stop the waxworms from spinning webs and to keep them sluggish. These waxworms are usually sold in woodshavings to inhibit pupation. The woodshavings are not food for the larvae.

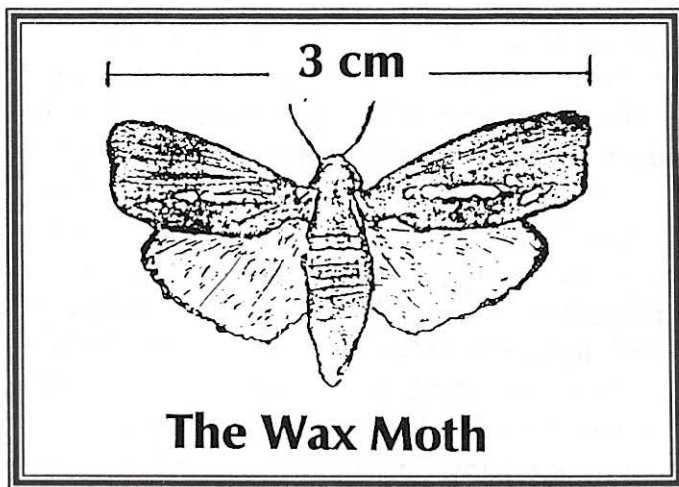
I use gallon size glass jars with metal screw caps for the culture containers. It is impor-

tant to use containers that can be tightly closed because the newly hatched larvae are very small (less than 1 mm long and 0.1 mm in diameter). Having a strong wandering drive and being very active, they can escape in large numbers from minute openings. If some do escape, do not be upset because they will not infest your house. I experienced

three or four mass escapes while experimenting with culture housing and the larvae just disappeared. Apparently the near microscopic larvae need to be surrounded by the right food after hatching to survive. Cut most of the top of the metal cap out leaving the screw rim with a supporting edge. Cut two circles to fit the jar top from copper window

screen, or preferably finer screen if you can find some, and a circle of laboratory filter paper. Sandwich the filter paper disc between the screen discs, put the sand-

wich on the jar lip, and tightly screw on the rim. This is (hopefully) an escape-proof ventilated culture container that can be easily cleaned. If you have trouble obtaining laboratory filter paper, try coffee filter paper. Be aware that the newly hatched larvae can penetrate through cotton plugs. You may have to experiment to find satisfactory materials for the ventilated lid.



The Wax Moth

I have had good results culturing waxworms on a mixture of breakfast corn flakes, honey, yeast, and beeswax. Not long ago I kept bees so I have a large amount of beeswax to use, but beeswax is too expensive to buy and the larvae preferentially consume it at an alarming rate. I switched to a mixture of 400 grams of vitamin-enriched breakfast cereal, 120 grams of wheat germ, 150 grams sugar, 220 grams glycerine, and 150 grams water, also with good results. Dissolve the sugar and glycerine in the water and slowly pour the mixture onto the dry material while stirring. Fill the culture jar one fourth to one third full of the diet and put in about five dozen waxworms. Screw the ventilated lid on tightly and place the jar in a dark place at about 85°F. If you do not have an incubator or live in a constant 85° climate, use styrofoam board and glue to make an open-topped insulating box for each jar. The metabolic heat given off by the waxworms will keep the culture warm. I keep my culture on a high shelf to take advantage of the heat layer near the ceiling and have had satisfactory larval growth without using artificial heat. In a few days the larvae will begin to pupate. They have been damaged by their heat treatment so they will not spin a silken cocoon around their pupa case as they

ordinarily do. In about two weeks the wax moths will begin to emerge. Some of the pupae may die because of their heat treatment and some of the moths may die while emerging, but enough should emerge to give your culture a strong start. If all the pupae or emerging moths die, buy more waxworms at another shop because they may have been kept too long and may have been exposed to too high temperatures.

The moths (which do not eat) will mate in a few hours after emergence and each female will lay an average of seven hundred eggs in a few days. The moths will die in about a week. The eggs are small pear-shaped white spheres laid in batches and are readily seen with a magnifying glass. Keep accordion-folded strips of wax paper on top of the diet and many of the eggs will be deposited on them. Take out some of the strips to start new cultures. The eggs will hatch in about nine or ten days and you will need a magnifying glass to see the newly hatched larvae which move surprisingly quickly. The voracious larvae grow quickly, will spin webs in the diet, and will congregate in a seething mass which will be 10° to 15° F. higher than the surrounding diet. Put your hand on the glass near the

mass of larvae and you will be surprised at the hot spot you feel. The diet and the inside walls of the culture jar will soon be coated with a dusty layer from the moth wing scales. It is important not to inhale this dust because the protein in the scales can cause severe allergic reactions in humans.

You can harvest the waxworms at any size you need. Wearing a dust mask, take the culture outside and scoop the diet into a plastic dishpan. The diet will be held together by the webs. Pull the diet apart and pick out the waxworms. Your cultured waxworms will be much more active and agile than the torpid waxworms bought in baitshops. They remind me of small white leeches by their movements. Put the diet and remaining larvae back into the culture jar and return to the raising area.

You can raise a number of generations in an individual diet which should be discarded when the culture weakens and the diet becomes completely riddled with webs and excrement. The larvae eat a surprisingly large amount of food and you will have to add additional amounts of diet mixture if you want to keep a culture going over several generations.

Keep a number of culture jars at different stages and you will always have more waxworms (at low cost) than you thought possible.

Be warned that without precautions the newly hatched larvae really do escape quite easily. If you do not have hordes of larvae, examine the filter paper with a strong magnifying glass to see if they are chewing their way out. The moths flatten out and can slip through very small cracks. It is irritating to have moths flying around your house, so keep the cultures escape-proof.

My first culture container was a plastic shoe box with holes in the sides for ventilation and the top held on by rubber bands. Needless to say, escapes of larvae and moths occurred continuously.

CLARIFICATION:

Please take note of the following clarifications and keep them in mind when your membership renewal comes up.

Memberships are for one year, extending from the first day of the month in which your dues are paid. We are not on a January 1st to January 1st calendar year membership basis. The requirement for cashier's checks applies only to members living outside the U.S.. U.S. members may pay their dues with personal checks.

Breeding Report of *Dendrobates Pumilio*

By: J. Zwoferink

It has now been more than six years since I purchased four *Dendrobates pumilio* from a shop in Utrecht (Holland). Prior to that I had had a little bit of experience with *Dendrobates leucomelas* and *Dendrobates auratus*. I had decided to try some frogs with which few people had realized much success (except in Holland).

There was not much information to be found in the literature and that which I did find was, for the most part, incorrect - or at best contradictory. Fortunately I had someone with whom to consult. Although he had yet to produce young froglets, he did have some tadpoles. I was able to avoid those things which had not worked out well for him. In the beginning this was a very great help to me, especially because at that time I was relatively inexperienced.

And then there was the beautiful moment when I found the first eggs!! I felt myself as happy as I could be and I thought that everything would go smoothly; I could not have been more wrong.

In those days I meticulously recorded everything that seemed even remotely important. The result of this was a breeding report that was in a telegram recording style. I recorded the data this way so that I could easily read it back. Many of the things which I at first wrote down, now seem quite normal and ordinary to me. However, at the time everything was of significance and so the record is more complete. Perhaps for someone else it can be of some help.

First I will give a brief description of my terrarium. It is tropical in its environment. The dimensions are as follows: 215 cm x 150 cm x 60 cm. One portion of the terrarium holds about fifty liters of water and there is a small waterfall circulating the water. The substrate consists of very fine *Osmunda* fiber. The sides and back of the terrarium are covered with cork which is about 2 cm thick, the surface of which I have roughened. Light is provided by four T.L. lamps, each 30 watt, and four spotlights, each 40 watt. The inside of the wooded top is painted white to provide for more reflection of the light. The main plants are bromelias, tillandsias, orchids, hoyas and the roots of a heder. The substrate is terraced at different heights. The temperature is maintained

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between 22° and 30° C. The humidity averages about 85%. The occupants of the terrarium are: four *Dendrobates pumilio* (2:2), three *Anolis pulchellus*, and five *Bombina orientalis*.

What follows is the breeding report:

First egg-laying:

Day 1 - September 21st, 1984

Five eggs have been layed, size = 1 mm. The eggs were deposited on a tray under a half coconut. Deposition of the eggs occurred in the evening at about 18.00 hr. The temperature was 22° C. The eggs were placed in water, submerged approximately one third. During the production of the eggs the male sat beside the coconut croaking loudly. There was adequate egg jelly. The humidity = 80%.

Day 6 - September 26th, 1984

One egg appears to be infertile - the yolk came out of the jelly.

Day 7 - September 27th, 1984

All four remaining eggs have partitioned themselves. One egg is smaller than the others.

Day 10 - September 30th, 1984

The four tadpoles are now about 3 mm. They are moving in the jelly.

Day 12 - October 2nd, 1984

The tadpoles are now about 5 mm, in the evening one emerged from the jelly.

Day 13 - October 3rd, 1984

The second tadpole released itself in the morning, the third did so in the evening. The tadpoles were placed in plastic cups with 3 cm of water, at a temperature of 22° C. I feed them with raw egg-yolk, liquified red and green (), and forellenpallet (fish-bait). At 14.00 hr. and 24.00 hr. I refreshed the water and feed them.

Day 14 - October 4th, 1984

I released the fourth tadpole from its jelly. This one is larger than the others.

Day 18 - October 8th, 1984

Three tadpoles are dead. The tadpole that I released remains alive and is

growing very well. It is black and is about 1 cm long.

Day 26 - October 16th, 1984

The tadpole eats well and moves a lot. Now it floats horizontally, initially they floated vertically.

Day 35 - October 25th, 1984

I feed cooked egg-yolk rather than raw, once a week I feed raw egg-yolk.

Day 62 - November 21st, 1984

The tadpole continues to grow very well. I have not refreshed the water for 48 hours; this does not seem to have any ill effect on the tadpole. Now I feed Tetramin. I change the liquifri every day and I feed cooked egg-yolk four days a week.

Day 101 - December 30th, 1984

Rear legs appear and the tadpole is about 1.5 cm long. This afternoon something dreadful has happened; the tadpole fell into the kitchen sink and was lost!!

Note to myself: **NEVER REFRESH THE WATER ABOVE THE KITCHEN SINK!**

Second egg-laying:

Day 1 - October 1st, 1984

Four eggs are in the tray beneath the coconut. One does not appear to be fertilized. I have decided to leave them in the terrarium for parental care.

Day 3 - October 3rd, 1984

The eggs are 1mm larger than those of the first clutch.

Day 4 - October 4th, 1984

One egg has become mouldy and I removed it at 09.30 hr. At 14.30 hr. the remaining eggs have disappeared, all that remains is a lot of jelly. The likely culprit is the Bombinas. That afternoon I removed the Bombinas.

Note to myself: **PERHAPS I SHOULD HAVE REFRESHED THE BOMBINAS ABOVE THE KITCHEN SINK!**

Third egg-laying:

Day 1 - October 10th, 1984

Five eggs on tray.

Day 2 - October 11th, 1984

In the evening the eggs are gone, only the jelly remains. The assumption is that the eggs have been eaten by the *pumilio*. I placed a large bromeliad, with water in its cup, near where the eggs had been.

Fourth egg-laying:

Day 1 - October 16th, 1984

Seven eggs (five large ones and two smaller ones). Until now all the eggs had been layed on a coconut-covered-tray in the left corner of the terrarium. This clutch is in the middle of the terrarium, also on a tray. Now I feed extra fruit-flies in the vicinity of the eggs. One of the male frogs is behaving strangely, he is climbing up and down the glass and perching beneath the spotlight where it is about 40° C.

Day 3 - October 18th, 1984

One egg has disappeared, the female visits the remaining eggs regularly.

Day 4 - October 19th, 1984

All eggs have disappeared!!

Fifth egg-laying:

October 28th, 1984

One tadpole is discovered on a leaf of the Bromiliad, it appears to be about seven days old. Also there is jelly, apparently from other eggs.

October 29th, 1984

Tadpole is dead.

Sixth egg-laying:

Day 1 - October 29th, 1984

In the afternoon two males and one female are seen together high in the terrarium in a large plant (*Cryptanthus*). Both the males are croaking and constantly kicking the female. They sit in a vent to vent position. For about 30 minutes one male is engaged in driving away the other. This he does by jumping at him and chasing him about in the terrarium. Upon a later check no

eggs are found in the plant but three are discovered in a tray. Later on in the evening I place a lid on the tray to prevent the eggs from being eaten.

Day 6 - November 3rd, 1984

It is 15.00 hr. The male and the female are very active on the lid of the tray. I remove the lid, thinking that they may lay eggs on it.

Day 7 - November 4th, 1984

Two tadpoles are gone, probably eaten by the male which was seen sitting next to the eggs. In the afternoon I see the male eating a tadpole. It is the male which had been acting strangely. I remove this male and place a new tray and coconut in the terrarium.

Seventh egg-laying:

Day 1 - November 11th, 1984

Five eggs have been layed on a *Cryptanthus* leaf on the right side of the terrarium. This is a place the frogs do not normally visit. They are well hidden by an overhanging leaf.

Day 2 - November 12th, 1984

Male was seen on the eggs; after he is gone all eggs are still present.

Day 6 - November 16th, 1984

The eggs are growing well but the female has not been seen near the eggs. I have placed a cup beneath the eggs, fearing that otherwise they may fall to the ground.

Day 7 - November 17th, 1984

The male is sitting on the eggs, pushing them down.

Day 9 - November 19th, 1984

Four eggs have disappeared, they have fallen into the cup, one eggs remains on the leaf.

Day 14 - November 24th, 1984

In the morning the female is seen sitting in the place of egg-laying.

Day 16 - November 26th, 1984

After sprinkling the terrarium, the one remaining tadpole has fallen into the cup. In the evening one tadpole is gone and the female is again on the leaf.

Day 20 - November 30th, 1984

Two tadpoles are dead.

Day 34 - December 14th, 1984

One tadpole remains alive.

Day 59 - January 8th, 1985

Last tadpole is dead.

Eighth egg-laying:

Day 1 - November 17th, 1984

Seven eggs are found on a tray.

Day 3 - November 20th, 1984

Two eggs appear moldy and are removed.

Day 9 - November 26th, 1984

Five tadpoles are released from the jelly. In the evening all tadpole are gone!

Day 11 - November 28th, 1984

I have removed the coconut and tray.

December 8th, 1984

I have placed the previously separated male back into the terrarium.

Ninth egg-laying:

Day 1 - December 5th, 1984

Eight eggs are found on a bromeliad leaf at 16.00 hr.. I cut the top of the leaf and placed a cup beneath it because the leaf was rotting.

Day 3 - December 8th, 1984

All the eggs appear to be good and are lying in the same place.

Day 13 - December 18th, 1984

All tadpoles have fallen into the cup.

Day 19 - December 24th, 1984

Seven tadpoles are alive.

Day 25 - December 30th, 1984

The seven tadpoles are growing stronger than those from the other layings.

Day 46 - January 20th, 1985

Six tadpoles are alive.

Day 53 - January 27th, 1985

All tadpoles are dead!

Tenth egg-laying:

Day 1 - December 24th, 1984

The eggs were inadvertently destroyed. They were on the same place as those from laying nine. The tadpoles are put in a tray, they appear to be seven days old.

Day 8 - December 31st, 1984

Five tadpoles are still in the jelly.

Day 9 - January 1st, 1985

I find five tadpoles in the water reservoir of the terrarium.

March 10th, 1985

I do not see the tadpoles anymore.

Eleventh egg-laying:

Day 1 - December 24th, 1984

Six eggs are discovered on a *Vanda* (orchid) leaf.

Day 10 - January 2nd, 1985

The male is wetting the tadpoles, which are moving very wildly.

Day 13 - January 5th, 1985

The female is observed sitting amid the eggs for about one hour. This is the first time the female has been observed doing this. None of the other females has been seen doing this before.

Day 14 - January 6th, 1985

The female sits amid the eggs and walks away with a tadpole on her back; she takes it to a bromeliad.

Day 16 - January 8th, 1985

The female is seen transporting a second tadpole.

Day 17 - January 9th, 1985

A third tadpole is transported by the female.

Day 18 - January 10th, 1985

The female transports the fourth tadpole. Each time the transporting occurred at about 15.30 hr..

Day 19 - January 11th, 1985

The female again sits amid the tadpoles but this time none are carried away.

Day 20 - January 12th, 1985

One tadpole has disappeared, presumably carried away by the female.

Day 24 - January 16th, 1985

Last tadpole lies dead on the leaf.

Twelfth egg-laying:

January 3rd, 1985

Eight eggs are deposited in the same location as with layings nine and ten. No parental care follows and clutch subsequently dries up.

Day 56 - February 17th

The bromeliad is removed from the terrarium for inspection. One tadpole (about 5 mm) is seen in the plant and also, four infertile (food) eggs. The bromeliad is immediately placed back into the terrarium.

Day 57 - February 18th, 1985

The female visits the tadpole again. The tadpole is grayish-brown and has two hind legs. It appears that the forelegs may soon emerge.

Day 61 - February 22nd, 1985

A reddish copper colour begins to appear on the tadpole's back.

Day 62 - February 23rd, 1985

The front legs emerge.

Day 66 - February 27th, 1985

I have removed the two bromeliads from the terrarium. From the right one comes two small frogs with short tails; the backs are red with small black spots. From the left one comes two small frogs and one tadpole without front legs. The one without the legs looks very healthy and is placed in a cup. The four little frogs look very healthy and appear well fed. I placed the four froglets in a separate terrarium with an abundance of fruit-flies and small white mites.

Day 70 - March 2nd, 1985

All four young frogs have completed metamorphosis.

Day 72 - March 4th, 1985

The remaining tadpole is placed back in the bromeliad.

Day 73 - March 5th, 1985

The young frogs are very active.

Day 74 - March 6th, 1985

The four young frogs are placed in the big terrarium. They are about 6 mm long.

Day 75 - March 7th, 1985

The remaining tadpole has assumed its colour. The female is seen with it.

Day 83 - March 15th, 1985

The remaining tadpole has taken to land and appears healthy.

Day 86 - March 18th, 1985

The tadpole has completed metamorphosis, the tail is completely resorbed.

Day 103 - April 4th, 1985

The last young frog is placed with the others in the big terrarium.

At this time all is going well with the breeding of *Dendrobates pumilio* in my terrarium. To summarize, it goes as follows:

- 1.) The male croaks loudly and pursues the female.
- 2.) The female selects a suitable place for the eggs.
- 3.) The male stays in the vicinity and fertilizes the eggs as soon as the female has gone.
- 4.) The male tends the clutch and keeps it wet.
- 5.) After about 14 days, The female transports the tadpoles to bromeliads one at a time.
- 6.) After several days the female begins to feed the tadpoles with infertile eggs.
- 7.) After about 70 days the tadpole have changed to young frogs.

The following index summarizes all the data:

A. = number of egg-layings

B. = number of eggs per clutch

C. = The egg deposition site (t = tray, b = bromeliad, c = cryptanthus, v = vanda).

D. = date of laying

E. = temperature

F. = eggs/tadpoles lost

<u>A.</u>	<u>B.</u>	<u>C.</u>	<u>D.</u>	<u>E.</u>	<u>F.</u>
1.	5	t	Sept 21	22°	--
2.	4	t	Oct 01	22°	Oct 04
3.	5	t	Oct 10	22°	Oct 11
4.	7	t	Oct 16	25°	Oct 19
5.	1	b	Oct 28	25°	Oct 29
6.	3	b	Oct 29	22°	Nov 04
7.	5	c	Nov 11	25°	Jan 08
8.	7	t	Nov 17	22°	Nov 16
9.	8	b	Dec 05	25°	Jan 27
10.	6	b	Dec 24	25°	Jan 01
11.	6	v	Dec 24	22°	Jan 16
12.	8	b	Jan 03	25°	--

From this time on everything went well; I had young animals every third month. Then it became necessary for me to move to another house and I faced the question - how will my frogs react to a smaller terrarium?

About two months before the moving I gave the frogs to a friend, who is a knowledgeable frog lover, by the name of Henk Ooms. I had decided to make a smaller terrarium because I was limited by space and I would have less time available for maintenance of a large terrarium. I also considered that in such a large terrarium as I had been using I did not have much control over my frogs. I constructed a corner terrarium with the following dimensions: 100 cm(h) x 60 cm(d) x 85 cm(l). The sides were covered with cork and the lighting consisted of two spotlights (25 watt each) and one T.L. of 18 watt. Inside there is a 50 cm tall waterfall. The terrarium is densely planted. This all took approximately four months, after which time I retrieved the frogs from Henk and put them in the new terrarium. After several days the males started to croak and I expected to have some egg laying. Then I observed a phenomenon that, prior to this, I had only seen in books, namely the wrestling of *Dendrobates pumilio*. The males kept jumping on each other and holding each other tightly at the waist. This went on for a few weeks and although there were some egg-layings, the eggs were either destroyed or neglected by the males. I soon came

to the conclusion that this terrarium was too small for two males. Therefore I decided to get rid of one of the males. Almost immediately the harmony returned and successful breeding began again.

In reading other reports of the breeding of *pumilio* I have seen it written that the frogs keep laying eggs while they are feeding tadpoles. My experience has been that the females stopped egg-laying once a tadpole had been transported to a bromeliad. I observed that the female fed the tadpoles almost every day with an average of four infertile eggs. I was pleased that the female did not continue to breed during this tadpole care period because I think this might have exhausted her.

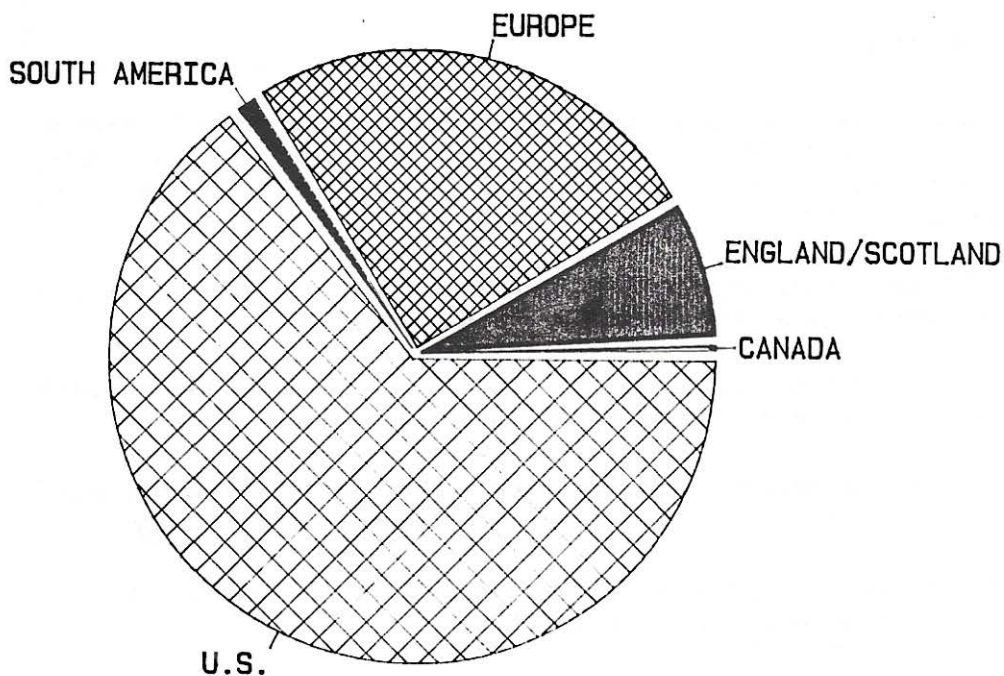
I do not think that *Dendrobates pumilio* is a beginner's frog. The young frogs need very small prey, such as mites. However I think that it is one of the most beautiful of dart-frogs. They call day and night and the noise is so pleasant that you would have to love it if you heard it.

In conclusion I would like to comment that I think it is a very good thing that more and more people are breeding dart-frogs. I suggest that if you are planning to buy frogs that you buy captive bred ones rather than wild caught ones. I say this not only because the captive bred frogs are cheaper and have less disease problems, but also because I think it would be good to stop the capture of these frogs in the wild. I do not share the opinion that wild collecting is of little effect on wild populations - all things add up!

With respect to my colleagues:

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I.S.S.D. MEMBERSHIP BREAKDOWN BY COUNTRY YEAR-END 1988



International Society for the Study of Dendrobatid Frogs

I S S D

A general statement of some of the goals and objectives of ISSD:

ISSD exists to:

: To encourage, stimulate, and wherever possible, facilitate scientific research as it relates to any and all aspects of the study of Dendrobatid frogs; including, but not limited to, ecological studies, toxicological studies, taxonomic studies, and studies concerned with husbandry and captive propagation.

: To unify those individuals who participate in these studies and to provide vehicles of communication for the dissemination of knowledge gained as a result of this research.

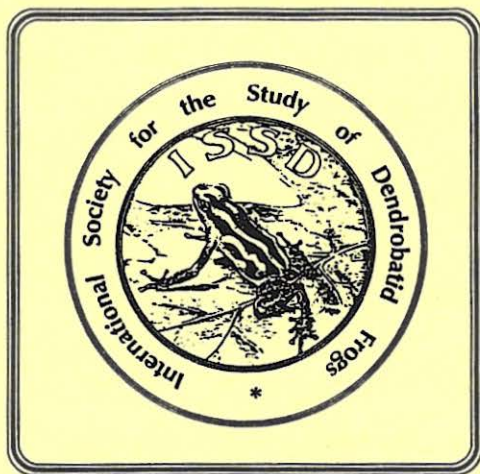
: To afford those individuals who participate in programs of captive propagation the opportunity to develop a breeders network to facilitate breeding loans and species trades.

: To assist those individuals who need, or desire, to communicate with foreign government agencies which control access to wild populations of Dendrobatids in countries where they exist naturally.

: To encourage uniformity in record keeping systems for captive propagation programs, as well as uniformity in methods of wild captured specimen disposition reporting.

: To encourage preservation of, and protection for, populations of threatened or endangered Dendrobatid species; while at the same time preserving opportunities for limited access to those populations by individuals with legitimate research interests.

: To encourage the establishment and maintenance of stable and genetically diverse captive populations of endangered or threatened species.



ISSD extends an invitation of membership to any and all persons who are interested in the study of Dendrobatid frogs.

Membership Registration:

Name: _____

Address: _____

Phone #: _____

Date: _____

Comments: _____

Annual membership dues are as follows: \$20.00 (U.S.\$) for members living in the U.S.A. and Canada; \$25.00 (U.S.\$) for members living in Europe and South America. Remittance should be made using one of the following methods (listed in order of preference). 1.) A Cashier's Check from a U.S. bank made out in U.S. dollars. 2.) A U.S. Postal Money Order made out in U.S. dollars. 3.) Cash - U.S. dollars, wrapped well so that it cannot be seen through the envelope, and sent via Registered Mail. 4.) A Cashier's Check from a Non-U.S. bank made out in the normal currency of the bank of issue, for an amount which will yield \$28.00 (U.S.\$) when it is exchanged.

Send registration forms and dues to:

ISSD - c/o Ed Tunstall
2320 West Palomino Drive
Chandler, Arizona
85224 U.S.A.